

Malnutrition Among Children Younger Than 5 Years-Old in Conflict Zones of Chiapas, Mexico

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We performed a cross-sectional, community-based survey, supplemented by interviews with community leaders in Chiapas, Mexico, to examine the prevalence and predictors of child malnutrition in regions affected by the Zapatista conflict.

The prevalence rates of stunting, wasting, and underweight were 54.1%, 2.9%, and 20.3%, respectively, in 2666 children aged younger than 5 years. Stunting was associated with indigenous ethnicity, poverty, region of residence, and intracommunity division. The results indicate that malnutrition is a serious public health problem in the studied regions. (*Am J Public Health*. 2007;97:229–232. doi: 10.2105/AJPH.2005.070409)

In Chiapas, Mexico, long-standing conflicts related to land tenure, religion, and other issues have been further complicated by an armed conflict between the Mexican government and the Ejército Zapatista de Liberación Nacional (“the Zapatistas”), which began in 1994 over Zapatista demands that the Mexican government address the alarming poverty conditions among the indigenous population. Social polarization and intolerance have led to forced displacement of more than 16 000 Chiapanecan citizens, politically motivated violence (including murder), and intracommunity divisions so complete as to have produced villages within which separate governments, clinics, schools, justice systems, and other services for adherents of the separate factions operate.^{2–5}

We postulated that chronic interparty and intracommunity conflict in Chiapas might be

associated with malnutrition, particularly stunting, in children. Because no published studies have addressed this question in this setting, we sought to describe the prevalence of malnutrition in children aged younger than 5 years in the 3 Chiapanecan regions most adversely affected by the Zapatista conflict and its association with various socioeconomic and conflict-related factors.

METHODS

In the regions most adversely affected by the armed conflict in Chiapas,⁶ we conducted a cross-sectional, population-based household survey, supplemented by semistructured interviews with community-based governing councils and health teams. We investigated the health conditions of and access to care for children in the conflict zone, including rates of childhood malnutrition, pulmonary tuberculosis, and maternal mortality. The methodology of the study has been described previously.⁶

Weight was measured with baby and hanging scales.⁷ Height was measured with infantometers (for children aged younger than 2 years) and stadiometers (for children aged 2 to 4 years).⁷ Age was obtained by asking the parent for each child's birthdate, confirming whenever possible (65% of children) with birth records or vaccination cards. Anthropometric data were analyzed with the Epi Info 2000 EpiNut package (Centers for Disease Control and Prevention, Atlanta, Ga), which classified children as stunted, wasted, or underweight; standardized z scores (obtained using Epi info) of less than 2.0 for these classifications were used as the cutoff point, and participants with impulsive results (those for whom the obtained measures of height and age gave an impossible nutritional status) were excluded.⁸ We estimated the association between stunting and other variables using logistic regression (consistent confidence intervals⁹ were used to adjust for clustering within communities), weighted to reflect probability of selection. Given the transversal design of the study, and the conditions of the region during the fieldwork that impacted the nonresponse rates, the estimated odds ratios were adequate to measure the magnitude of the association between the nutritional status and factors analyzed, but did not necessarily approximate

the prevalence ratio, because of the high prevalence of stunting.

RESULTS

The final sample included 21 government-aligned communities, 6 opposition-aligned communities, and 19 communities divided by political-party affiliation (government vs Zapatista-aligned).⁶ Four of the government-aligned communities were internally divided by religious or intraparty differences. We identified 2838 children aged younger than 5 years from 1779 households (20 households declined to participate).

Table 1 presents the individual, household, and community characteristics of the children in the study. All communities were predominantly indigenous (89.3% of the children in the study). The overall prevalence of stunting was 54.1% (n=2666 with analyzable data) and was significantly higher in divided communities ($P<.001$). The overall prevalence rates of wasting and underweight were 2.9% and 20.3%, respectively. Nearly all factors associated with either poverty or intracommunity division were significantly associated with stunting in bivariate analyses (data not shown). In multivariate analyses, child's age, dirt-floored house (a proxy for low socioeconomic status), maternal education, indigenous ethnicity, region of residence, and intracommunity division retained their significant associations with stunting (Table 2).

DISCUSSION

The overall prevalence of stunting observed was substantially greater than that reported by the Mexican National Nutritional Survey (17.8% nationally; 29.2% in Chiapas State)¹⁰ and was consistent with observations from other surveys performed in Chiapas during the Zapatista conflict.^{11,12} In fact, the prevalence of stunting present in the children we examined resembled that in child residents of conflict zones in Afghanistan and Angola (63.7% and 57.3%, respectively)^{13,14} more than it did that in children in northern Mexico (7.1%). Such high levels of malnutrition place these children at higher risk for diminished school and work performance, as well as mortality.^{15–21} These effects may worsen disparities between the rural indigenous residents of Chiapas and

TABLE 1—Characteristics of Children Aged Younger Than 5 Years in Conflict Zones of Chiapas, Mexico, by Presence of Intracommunity Division

Characteristics of Children and Their Households or Villages ^a	Intracommunity Division			
	All Children (N = 2838), no. (%)	No Community Division (n = 1295), no. (%)	Community Divided, Other Than by Political Party ^b (n = 301), no. (%)	Community Divided by Political Party (n = 1242), no. (%)
Stunting	1442 (54.1) ^c	592 (48.5)	165 (62.7)	685 (58.0)
Wasting	79 (2.9) ^d	34 (2.8)	6 (2.2)	39 (3.3)
Underweight	549 (20.3) ^e	230 (18.5)	73 (26.7)	246 (20.6)
Maternal education, mean years completed \pm SD	2.9 \pm 2.6	3.1 \pm 2.7	2.2 \pm 2.7	2.8 \pm 2.4
Whole family slept in same room	1764 (62.2)	729 (56.4)	200 (66.7)	835 (67.3)
Household has dirt floor	2186 (77.1)	919 (71.1)	220 (73.1)	1047 (84.4)
Household cooked with wood fuel	2738 (96.7) ^f	1228 (95.0)	289 (96.3)	1221 (98.6)
Maternal language fluency				
Mother speaks indigenous language only	1486 (52.6) ^g	654 (50.9)	167 (55.7)	665 (53.8)
Mother bilingual	1040 (36.8) ^h	479 (37.3)	59 (19.7)	502 (40.6)
Mother speaks Spanish only	297 (10.5)	153 (11.9)	74 (24.7)	70 (5.7)
Household has piped water	1918 (67.6)	947 (73.1)	126 (41.9)	845 (68.0)
Household has electricity from local grid	2476 (87.2)	1167 (90.1)	264 (87.7)	1045 (84.1)
Household has toilet or latrine	2084 (73.4)	926 (71.5)	165 (54.8)	993 (80.0)
Household has refrigerator	152 (5.4)	99 (7.6)	19 (6.3)	34 (2.7)
Travel time to nearest clinic, min, mean \pm SD	25.5 \pm 31.3	25.5 \pm 27.0	3.0 \pm 9.0	31.0 \pm 36.1
Travel time to nearest hospital, min, mean \pm SD	147.5 \pm 120.3	170.9 \pm 157.5	106.1 \pm 58.7	133.0 \pm 71.9
Region of residence				
Norte region	1130 (39.8)	464 (35.8)	113 (37.5)	553 (44.5)
Altos region	880 (31.0)	354 (27.3)	188 (62.5)	338 (27.2)
Selva region	828 (29.2)	477 (36.8)	0	351 (28.3)
History of displacement of residents from village	1197 (42.2)	308 (23.8)	163 (54.2)	726 (58.5)
Survey only allowed to include 1 of 2 antagonistic factions ^h	604 (21.3)	NA	30 (10.0)	574 (46.2)
Alleged bias in provision of public services (other than health)	342 (12.1)	0	158 (52.5)	184 (14.8)
Alleged bias in provision of community-level health services	905 (31.9)	35 (2.7)	301 (100)	569 (45.8)
Political-party affiliation of household				
Aligned with government party	1910 (67.3)	1034 (79.9)	301 (100)	575 (46.3)
Political party affiliation not stated	482 (17.0)	0	0	482 (38.8)
Aligned with opposition	446 (15.7)	261 (20.2)	0	185 (14.9)
From systematically selected households	1755 (61.8)	870 (67.2)	209 (69.4)	676 (54.4)

Note. Results given as percentage of number of children with complete data unless otherwise indicated.

^aThere were no differences among the following characteristics: maternal age (mean years \pm SD = 27.8 \pm 7.6), total number of persons living in household (mean \pm SD = 7.1 \pm 2.7), total number of children younger than 5 years living in household (mean \pm SD = 1.9 \pm 0.8); child had up-to-date immunizations (for age) = 72.6%.

^bDivision by religion, in the absence of political-party division, or division within a single political party.

^cNot included in the analysis: 94 children (36 without community division; 23 community divided, other than by political party; 35 community divided by political party).

^dNot included in the analysis: 4 children (2 without community division; 2 community divided by political party).

^eNot included in the analysis: 27 children (10 without community division; 7 community divided, other than by political party; 10 community divided by political party).

^fNot included in the analysis: 6 children (2 without community division; 1 community divided, other than by political party; 3 community divided by political party).

^gNot included in the analysis: 4 children (all of them without community division).

^hIn some divided communities, the survey was only permitted if those in the opposing faction were not surveyed.

others, thus predisposing them to continued cycles of violence and polarization. Furthermore, our findings may have underestimated the true prevalence of malnutrition, because we suspect that communities with higher levels of conflict and poverty were more likely to refuse participation in the study.

A key finding of our study was the strong association between factors related to conflict—both the Zapatista conflict and other sources of intracommunity division—and poor nutritional status. Although causality could not be firmly established by our cross-sectional methods, intracommunity divisions and intercommunity conflict may decrease access to food and increase vulnerability to infectious diseases in several ways: violence and social tensions may disrupt traditional mechanisms of intracommunity cooperation, thus interfering with cultivation and marketing of crops; maternal stress may diminish breastmilk production^{22,23}; and religious or political discrimination may impede access to health services. However, because the study sample was not representative of the entire population of the study regions, the generalizability of our observations is limited. Nevertheless, given the environment of conflict,⁶ our data are unique. If circumstances permit, further confirmatory studies should be conducted.

Childhood malnutrition is a serious public health problem in the conflict-affected regions of Chiapas. Conflict-related divisions may serve to increase disparities between this and other Mexican populations. The observed levels of malnutrition compromise the health of Chiapanecan children.^{24,25} ■

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TABLE 2—Association of Stunting With Child, Family, and Community Characteristics in Conflict Zones of Chiapas, Mexico: Multivariate Analysis

	Odds Ratio (95% Confidence Interval)	P
Age of child, mo		
≤ 5	Reference	—
6–11	3.0 (1.8, 5.1)	<.001
12–23	9.1 (4.8, 17.3)	<.001
24–35	8.2 (4.2, 16.1)	<.001
36–47	9.0 (4.8, 17.0)	<.001
48–59	12.1 (5.6, 26.1)	<.001
Maternal education (at least 1 year)	0.9 (0.9, 1.0)	.006
Household has dirt floor	1.6 (1.2, 2.2)	.002
Maternal language fluency		
Monolingual Spanish speaker	Reference	—
Bilingual indigenous: Spanish	1.8 (1.1, 3.1)	.018
Monolingual indigenous language	1.9 (1.3, 2.8)	.001
Region of residence		
Norte region	Reference	—
Altos region	2.5 (1.3, 4.7)	.006
Selva region	1.5 (1.0, 2.3)	.055
Intracommunity division		
Community not divided	Reference	—
Community divided, not by political party	2.7 (1.4, 5.3)	.005
Community divided by political party	1.8 (1.1, 2.8)	.013

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Contributors

H.J. Sánchez-Pérez originated and designed the study, performed the fieldwork, analyzed and interpreted the data, and wrote the brief. M.A. Hernán and D. Ford participated in the origination and design of the study, in the analysis and interpretation of data, and in revising critically the important intellectual content of the brief. A. Ríos-González participated in the fieldwork, in the analysis and interpretation of data, and in preparation of the brief. M. Arana-Cedeño participated in the origination and design of the study, in the fieldwork, and in the writing of the brief. A. Navarro and M.A. Micek participated in the analysis and interpretation of data and in revising critically the important intellectual content of the brief. P. Brentlinger participated in the origination and design of the study, in the analysis and interpretation of data, in revising critically the important intellectual content of the brief, and in drafting the final version.

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Human Participant Protection

At the time of study inception, there was no functioning institutional review board in Chiapas, and Chiapanecan researchers interpreted Mexican national regulations as meaning that minimal-risk community-survey protocols did not require formal review. However, oral informed consent was obtained at multiple levels in each community studied. Initially, consent was obtained from community authorities, generally common-lands commissioners ("comisariados ejidales"), and health and education committees. During their deliberations, community-level authorities were permitted to delete any questions they considered objectionable from the study protocol. Subsequently, an

assembly of the entire adult population was called, to ask for collective consent. Finally, in each household, permission was requested of the head of the family. Communities were assured that the names of individual communities would remain confidential, as would each individual community's survey results. The investigators also promised to present each community's study findings to the community after data analysis. The study protocol was also approved by a panel assembled by Physicians for Human Rights, after deliberations conducted in accordance with the Declaration of Helsinki.

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